

## CLAIMS

What is claimed is:

- 1 1. A method for subcarrier allocation and loading for a multi-carrier, multi-  
2 subscriber system, comprising:  
3 associating at least one cluster in a first set of clusters of subcarriers for use  
4 in communication with a first subscriber;  
5 associating at least one cluster in a second set of clusters of subcarriers for  
6 use in communication with a second subscriber;  
7 for each cluster associated for use in communication with the first  
8 subscriber and the second subscriber, multiplexing a usage of said each cluster  
9 between the first subscriber during a first time division and the second  
10 subscriber during a second time division.
- 1 2. The method of claim 1, wherein multiplexing includes assigning said each  
2 cluster to a one of the first subscriber and the second subscriber that has a highest  
3 transmission rate of transmission rates of subscribers associated with said each  
4 cluster.
- 1 3. The method of claim 2, wherein the transmission rates are weighted.

1 4. The method of claim 3, wherein each one of the transmission rates is  
2 weighted based on a proportion of time that a subscriber has transmitted on said  
3 each cluster.

1 5. The method of claim 1, wherein multiplexing includes periodically  
2 reassigning said each cluster to a one of the first subscriber and the second  
3 subscriber.

1 6. The method of claim 1, wherein multiplexing includes assigning said each  
2 cluster to a one of the first subscriber and the second subscriber based on a  
3 probability that the cluster will be used by the first subscriber and a probability  
4 that the cluster will be used by the second subscriber.

1 7. The method of claim 1, wherein associating at least one cluster in the first  
2 set for use in communication with the first subscriber includes selecting the at  
3 least one cluster based on a SINR and a traffic load of each one of the at least one  
4 cluster.

1 8. The method of claim 7, wherein the traffic load of each one of the at least  
2 one cluster is a queue fullness of a queue associated with that one of the at least  
3 one cluster.

1 9. The method of claim 7, wherein selecting the at least one cluster based on  
2 a SINR and a traffic load of each one of the at least one cluster includes balancing  
3 lengths of queues associated with each one of the at least one cluster.

1 10. The method of claim 1, wherein multiplexing includes assigning said each  
2 cluster to a one of the first subscriber and the second subscriber based on a  
3 quality of service requirement of the first subscriber and a quality of service  
4 requirement of the second subscriber.

1 11. The method of claim 10, wherein assigning includes allocating said each  
2 cluster to a one of the first subscriber and the second subscriber having a lower  
3 quality of service requirement than that had by another one of the first subscriber  
4 and the second subscriber during periods of time in which a one of the first  
5 subscriber and the second subscriber having a higher quality of service  
6 requirement than that had by another one of the first subscriber and the second  
7 subscriber does not transmit on said each cluster.

1 12. The method of claim 1, wherein associating at least one cluster in the first  
2 set for use in communication with the first subscriber includes selecting the at  
3 least one cluster based on a bandwidth requirement of the first subscriber.

1 13. The method of claim 1, wherein associating at least one cluster in the first  
2 set for use in communication with the first subscriber includes selecting a subset  
3 of the first set having a least instantaneous delay ratio for the first subscriber of  
4 any instantaneous delay ratio for the first subscriber of any subset of the first set.

1 14. The method of claim 1, wherein associating at least one cluster in the first  
2 set for use in communication with the first subscriber includes selecting a subset  
3 of the first set having a least statistical delay ratio for the first subscriber of any  
4 statistical delay ratio for the first subscriber of any subset of the first set.

1 15. The method of claim 1, wherein multiplexing includes:  
2 loading data associated with the first subscriber into a queue associated  
3 with said each cluster upon determining that a data packet is present in a queue  
4 associated with the first subscriber; and  
5 loading data associated with the second subscriber into the queue  
6 associated with said each cluster upon determining that a data packet is present  
7 in a queue associated with the second subscriber.

1 16. The method of claim 15, wherein loading data associated with the first  
2 subscriber and loading data associated with the second subscriber includes  
3 loading the data associated with a one of the first subscriber and the second  
4 subscriber having a higher average transmission rate than that had by another

5 one of the first subscriber and the second subscriber before loading the data  
6 associated with a one of the first subscriber and the second subscriber having a  
7 lower average transmission rate than that had by another one of the first  
8 subscriber and the second subscriber.

1 17. The method of claim 16, wherein the average transmission rate of the first  
2 subscriber and the average transmission rate of the second subscriber are  
3 weighted.

1 18. The method of claim 16, wherein the average transmission rate of the first  
2 subscriber is weighted based on a proportion of time that the first subscriber has  
3 transmitted on said each cluster and the average transmission rate of the second  
4 subscriber is weighted based on a proportion of time that the second subscriber  
5 has transmitted on said each cluster.

1 19. The method of claim 15, wherein loading data associated with the first  
2 subscriber and loading data associated with the second subscriber includes  
3 loading the data associated with a one of the first subscriber and the second  
4 subscriber having a higher quality of service requirement than that had by  
5 another one of the first subscriber and the second subscriber before loading the  
6 data associated with a one of the first subscriber and the second subscriber

7 having a lower quality of service requirement than that had by another one of  
8 the first subscriber and the second subscriber.

1 20. The method of claim 15, wherein loading data associated with the first  
2 subscriber into the queue associated with said each cluster includes loading data  
3 into a segment of the queue having a lowest delay of any delay of any segment of  
4 the queue.

1 21. The method of claim 20, wherein loading data associated with the first  
2 subscriber into the queue associated with said each cluster includes loading data  
3 into a segment of the queue having a smallest cluster index of any cluster index  
4 of any segment of the queue.

1 22. The method of claim 15, wherein loading data associated with the first  
2 subscriber into a queue associated with said each cluster includes preempting a  
3 loading of data associated with a third subscriber into the queue upon  
4 determining that the data associated with the first subscriber has a higher quality  
5 of service requirement than that had by the data associated with the third  
6 subscriber.

1 23. The method of claim 15, wherein loading data associated with the first  
2 subscriber includes loading data having a highest quality of service requirement

3 of any data associated with the first subscriber before loading other data  
4 associated with the first subscriber.

1 24. The method of claim 1, wherein multiplexing includes informing the first  
2 subscriber of a first time division multiplexing index, corresponding to the first  
3 subscriber, for said each cluster, during an allocation phase.

1 25. The method of claim 1, wherein multiplexing includes embedding a time  
2 division multiplexing index, corresponding to the first subscriber, in a segment  
3 of said each cluster intended for the first subscriber.

1 26. The method of claim 25, wherein the time division multiplexing index  
2 corresponding to the first subscriber varies between different ones of the clusters.

1 27. The method of claim 25, wherein embedding the time division  
2 multiplexing index includes encoding the time division multiplexing index.

1 28. The method of claim 1, wherein multiplexing includes transmitting, with  
2 data intended for the first subscriber that has been loaded into a segment of said  
3 each cluster, a preamble for the segment that includes a time division  
4 multiplexing index, corresponding to the first subscriber, for said each cluster.

1 29. The method of claim 28, further comprising:  
 2 the first subscriber receiving the data intended for the first subscriber,  
 3 with the preamble; and  
 4 upon the first subscriber recognizing the time division multiplexing index  
 5 included in the preamble as matching a time division multiplexing index  
 6 received by the first subscriber during an allocation phase, the first subscriber  
 7 decoding the data and passing the data to an upper layer.

1 30. The method of claim 1, wherein multiplexing includes scrambling data,  
 2 intended for the first subscriber, using a scrambling sequence corresponding to a  
 3 time division multiplexing index, corresponding to the first subscriber, for said  
 4 each cluster.

1 31. The method of claim 30, further comprising:  
 2 the first subscriber receiving the data intended for the first subscriber; and  
 3 upon the first subscriber successfully descrambling the data using the  
 4 scrambling sequence corresponding to a time division multiplexing index  
 5 received by the first subscriber during an allocation phase, the first subscriber  
 6 decoding the data and passing the data to an upper layer.

1 32. A base station, comprising:  
 2 user data queues to store data transmitted from subscribers;



3           multiplexing logic coupled with the user data queues to receive feedback  
4   information from subscribers, to allocate, based on the feedback information, one  
5   or more clusters of subcarriers to each subscriber, and to time division multiplex  
6   data from the user data queues into cluster data queues corresponding to those  
7   of the clusters allocated to more than one subscriber; and  
8           the cluster data queues coupled with the multiplexing logic to receive data  
9   from the multiplexing logic and store the data for transmission on corresponding  
10   clusters of subcarriers.

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